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**TRANSMITTAL LETTER**  
**APPEAL BRIEF**

Applicant : Michel J.F. Digonnet  
 App. No : 10/616,693  
 Filed : July 10, 2003  
 For : FIBER OPTIC SENSORS WITH  
       REDUCED NOISE  
 Examiner : Dinh D. Chiem  
 Art Unit : 2883

**CERTIFICATE OF MAILING**

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January 29, 2007

(Date)

Bruce S. Itchkawitz, Reg. No. 47,671

**Mail Stop Appeal Brief - Patents**  
 Commissioner for Patents  
 P.O. Box 1450  
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Docket No. : STANF.130A

**Customer No.: 20,995**

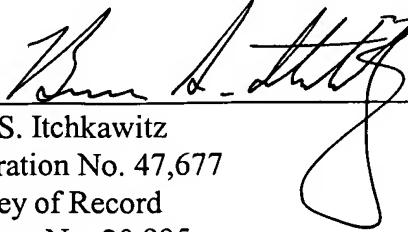
Application No. : 10/616,693

Filing Date : July 10, 2003

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Dated: January 29, 2007

  
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### APPEAL BRIEF

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Art Unit : 2883

**Mail Stop Appeal Brief-Patents**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

Applicant (Appellant) is appealing the rejection of Claims 1-15 and 49-57 of the present application as stated in the Final Office Action mailed on August 25, 2006. The rejected claims were also previously rejected in the Final Office Action mailed on February 9, 2006.

Pursuant to 37 C.F.R. § 41.37, this Appeal Brief is being filed within two months from the date of receipt of the Notice of Appeal by the U.S. Patent and Trademark Office on December 1, 2006. Pursuant to the August 25, 2006 Final Office Action, the previously paid appeal brief fee can be applied to the present appeal. Please charge any additional fees, including any fees for additional extensions of time, or credit overpayment to Deposit Account No. 11-1410.

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### **I. REAL PARTY IN INTEREST**

The real party in interest of the present application is the Assignee, The Board of Trustees of the Leland Stanford Junior University.

### **II. RELATED APPEALS AND INTERFERENCES**

Appellant hereby notifies the Board of Patent Appeals that Appellant, the Appellant's Legal Representative, and the Assignee do not know of any other prior or pending appeals, interferences, or judicial proceedings which may be related to, directly affect or be directly affected by or have any bearing on the Board's decision in the pending appeal.

### **III. STATUS OF CLAIMS**

Claims 16-48 have been canceled without prejudice and Claims 1-15 and 49-57 are currently pending in the application. A copy of the claims is attached hereto as an appendix. All of the pending claims were finally rejected by the Examiner in the August 25, 2006 Final Office Action. Rejected Claims 1-15 and 49-57 are the subject of this appeal.

### **IV. STATUS OF AMENDMENTS**

Appellant amended the pending claims in the "Revised Amendment and Response to February 9, 2006 Final Office Action," filed May 4, 2006, by canceling Claims 16-48 without prejudice. Therefore, Appellant understands that Claims 1-15 and 49-57 are currently pending.

### **V. SUMMARY OF CLAIMED SUBJECT MATTER**

The present invention relates to fiber optic interferometers and, more particularly, relates to fiber optic Sagnac interferometers for sensing, for example, rotation, movement, pressure, or other stimuli.

One aspect of the present invention comprises an optical sensor 5 that includes a light source 16, a directional coupler 34, a hollow-core photonic-bandgap fiber 13, and an optical detector 30. The light source 16 has an output that emits a first optical signal. The directional coupler 34 comprises at least a first port, a second port, and a third port. The first port is optically coupled to the light source 16 to receive the first optical signal emitted from the light source 16. The first port is optically coupled to a second port and to a third port such that the first optical signal received by the first port is split into a second optical signal output by the second port and a third optical signal output by the third port. The hollow-core photonic-

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bandgap fiber 13 has a hollow core 112 surrounded by a cladding 114. The hollow-core photonic-bandgap fiber 13 is optically coupled to the second port and to the third port to form an optical loop 14 such that the second optical signal and the third optical signal counterpropagate through the hollow-core photonic-bandgap fiber 13 and return to the third port and to the second optical port, respectively. The cladding 114 of the hollow-core photonic-bandgap fiber 13 substantially confines the counterpropagating second optical signal and third optical signal within the hollow core 112. The optical detector 30 is located at a position in the optical sensor 5 to receive the counterpropagating second and third optical signals after the second and third optical signals have traversed the hollow-core photonic-bandgap fiber 13. Reference numbers are to the present application unless indicated otherwise. Paragraphs [0022] to [0076] and Figures 1-6 illustrate various examples of the optical sensor.

## **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

- A) Whether independent Claim 1 and dependent Claims 2, 10-15 and 49-57 are unpatentable under 35 U.S.C. § 103(a) over U.S. Patent No. 4,773,759 issued to Bergh et al. (“Bergh”) in view of U.S. Patent No. 6,389,187 issued to Greenaway et al. (“Greenaway”) and “The Free Dictionary by Farlex (<http://encyclopedia.thefreedictionary.com/Photonic-crystal+fiber>)” (“Farlex”).
- B) Whether dependent Claims 3-9 are unpatentable under 35 U.S.C. § 103(a) over Bergh in view of Greenaway, and further in view of U.S. Patent No. 6,108,086 issued to Michal et al. (“Michal”).

## **VII. ARGUMENT**

### **Rejection of Claims 1, 2, 10-15, and 49-57 under 35 U.S.C. § 103(a) over Bergh in view of Greenaway and Farlex**

#### **Claim 1**

Appellant submits that the Examiner has not established a *prima facie* case of obviousness of Claim 1 under 35 U.S.C. § 103(a) over Bergh in view of Greenaway and Farlex. The Examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness, and if the Examiner does not produce a *prima facie* case, Appellant is under no obligation to submit evidence of nonobviousness. M.P.E.P. § 2142, page 2100-125 (Eighth

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Edition, Rev. 5, August 2006); *see also, In re Piasecki*, 745 F.2d 1468, 1471-72, 223 U.S.P.Q. 785 (Fed. Cir. 1984).

To establish a *prima facie* case of obviousness, three basic criteria must be met: (i) the prior art reference (or references when combined) must teach or suggest all the claim limitations; (ii) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings; and (iii) there must be a reasonable expectation of success. *See, e.g.*, M.P.E.P. § 2143. As discussed more fully below, Appellant submits that the Examiner has not established a *prima facie* case of obviousness under 35 U.S.C. § 103(a).

i. Farlex is improperly applied as prior art to the present application

Except for the addition of citing Farlex, the Examiner has asserted the same arguments in the August 25, 2006 Final Office Action as were previously asserted in the February 9, 2006 Final Office Action and in the June 8, 2006 Advisory Action, and in view of which prosecution was reopened in the June 13, 2006 Notice of Panel Decision from Pre-Appeal Brief Review. Appellant submits that Farlex has been improperly applied as prior art to the present application.

Farlex is a webpage with content obtained primarily from “Wikipedia,” a web-based free encyclopedia. A search of the term “photonic-crystal fiber” on the Farlex website (<http://encyclopedia.thefreedictionary.com>) results in a link to the “photonic-crystal fiber” webpage ([http://en.wikipedia.org/wiki/Photonic-crystal\\_fiber](http://en.wikipedia.org/wiki/Photonic-crystal_fiber)) of the Wikipedia website (<http://en.wikipedia.org>), from which the Farlex reference is obtained. The history of this webpage corresponding to the Farlex reference (accessed on the webpage [http://en.wikipedia.org/w/index.php?title=Photonic-crystal\\_fiber&action=history](http://en.wikipedia.org/w/index.php?title=Photonic-crystal_fiber&action=history)) shows that the webpage was initially created on September 21, 2004, and the portion of the webpage regarding the photonic-crystal fiber cores was initially added on April 3, 2005. Both of these dates are well after the filing date of the present application. Pursuant to M.P.E.P. § 2128, prior art disclosures on the Internet are considered to be publicly available as of the date that the item was publicly posted. Therefore, Farlex is not properly cited as prior art to the present application.

In addition, to the extent that the Examiner is using Farlex to provide evidence of the state of the art at the time the present invention was made, Appellant submits that use of

information from Wikipedia is untrustworthy for rejecting claims. As explained on the Wikipedia website itself, “*anyone* with access to an Internet-connected computer can edit, correct, or improve information throughout the encyclopedia” and that “Wikipedia is an ongoing work to which in principle anybody can contribute.” (See, <http://en.wikipedia.org/wiki/Wikipedia:About>; emphasis in original) As John Doll, Commissioner of Patents for the U.S. Patent and Trademark Office, was quoted in BusinessWeekOnline, ([http://www.businessweek.com/magazine/content/06\\_36/c3999012.htm](http://www.businessweek.com/magazine/content/06_36/c3999012.htm)) “The problem with Wikipedia is that it’s constantly changing. We’ve taken Wikipedia off our list of accepted sources of information.” Therefore, use of Farlex as a prior art reference in the rejection of Claim 1 of the present application is improper.

ii. Claim 1 includes limitations not taught or suggested by Bergh in view of Greenaway

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). Appellant submits that without Farlex, the Examiner has not established a *prima facie* case of obviousness because Claim 1 includes limitations not taught or suggested by the combination of Bergh in view of Greenaway.

- As pending, Claim 1 recites (emphasis added):

1. An optical sensor comprising:  
a light source having an output that emits a first optical signal;  
a first directional coupler comprising at least a first port, a second port and a third port, the first port optically coupled to the light source to receive the first optical signal emitted from the light source, the first port optically coupled to the second port and to the third port such that the first optical signal received by the first port is split into a second optical signal output by the second port and a third optical signal output by the third port;

**a hollow-core photonic-bandgap fiber having a hollow core surrounded by a cladding,** the hollow-core photonic-bandgap fiber optically coupled to the second port and to the third port to form an optical loop such that the second optical signal and the third optical signal counterpropagate through the hollow-core photonic-bandgap fiber and return to the third port and the second port, respectively, the cladding of the hollow-core photonic-bandgap fiber substantially confining the

counterpropagating second optical signal and third optical signal within the hollow core; and

an optical detector located at a position in the optical sensor to receive the counterpropagating second and third optical signals after the second and third optical signals have traversed the hollow-core photonic-bandgap fiber.

Bergh discloses a fiber optic interferometer that includes a light source, a directional coupler, an optical detector, and an optical fiber that is formed in a loop comprising a plurality of turns. The fiber optic interferometer disclosed by Bergh uses the directional coupler to split a light signal into two waves with unequal intensities, to input these waves into the fiber optic loop so as to propagate in opposite directions (*i.e.*, counterpropagate) and to recombine these waves after counterpropagating through the loop to form an output signal. (*See, e.g.*, Bergh at column 2, lines 8-32.) As acknowledged by the Examiner in the August 25, 2006 Final Office Action, Bergh does not disclose or suggest that the optical fiber loop comprises “a hollow-core photonic-bandgap fiber having a hollow core surrounded by a cladding,” as recited by Claim 1.

Greenaway discloses an optical fiber bend sensor that sends optical signals along an optical fiber having multiple cores, twice through a first core and then twice through a second core. (Greenaway at column 10, line 49 – column 11, line 15.) Interference patterns in the light that propagates through the two cores is used to detect bends in the optical fiber. (Greenaway at column 11, lines 15-32.) Greenaway further discloses that the multi-core fiber “may be a photonic crystal fibre.” (Greenaway at column 4, lines 44-45.)

Appellant submits that the term “photonic crystal fibre” used by Greenaway refers to the structure of the cladding of the fiber, and does not specify whether one or more of the cores are hollow or not. Thus, by merely disclosing a “photonic crystal fibre,” Greenaway does not disclose or suggest a “hollow-core photonic-bandgap fiber having a hollow core,” as recited by Claim 1.

Furthermore, Appellant submits that the term “photonic crystal fibre” used by Greenaway is a broad term which includes optical fibers with one or more hollow cores, one or more solid cores, combinations of hollow cores and solid cores, and cores filled with various solid or

gaseous materials. The Farlex reference, which was improperly applied by the Examiner as prior art as discussed above, is also in accordance with this interpretation.

Appellant submits that the disclosure of the genus of “photonic bandgap fibers” by Greenaway does not teach the species of “hollow-core photonic-bandgap fiber having a hollow core,” as recited by Claim 1. “Earlier disclosure of a genus does not necessarily prevent patenting a species member of the genus.” *Eli Lilly & Co. v. Board of Regents of the University of Washington*, 334 F.3d 1264, 67 U.S.P.Q.2d 1161 (Fed. Cir. 2003); *see also, Bristol-Myers Squibb Co. v. Ben Veuve Laboratories, Inc.*, 246 F.3d 1368, 1380 (Fed. Cir. 2001).

Furthermore, pursuant to M.P.E.P. § 2112(IV) (Rev. 5, August 2006, page 2100-47), “[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic” (emphasis in original; citing *In re Rijckaert*, 9 F.3d 1531, 1534, 28 U.S.P.Q.2d 1955, 1957 (Fed. Cir. 1993); *In re Oelrich*, 666 F.2d 578, 581-82, 212 U.S.P.Q. 323, 326 (C.C.P.A. 1981)). The mere fact that a certain thing may result from a given set of circumstances is not sufficient. “Inherency may not be established by probabilities or possibilities.” *In re Robertson*, 169 F.3d 743, 745, 49 U.S.P.Q.2d 1949, 1950-51 (Fed. Cir. 1999). To establish inherency, the Examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the prior art. *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)(emphasis in original).

Appellant submits that Greenaway does not inherently refer to a “hollow-core photonic-bandgap fiber” as recited by Claim 1. Greenaway’s disclosure of a “photonic-crystal fiber” includes fibers with one or more hollow cores, one or more solid cores, combinations of hollow cores and solid cores, and cores filled with various solid or gaseous materials, so the term “photonic crystal fibre” as used by Greenaway cannot be relied upon as a disclosure of a “hollow-core photonic-bandgap fiber,” as recited by Claim 1. Thus, the Examiner has not satisfied his burden to show that all the limitations of Claim 1 are taught or suggested by the prior art, so Claim 1 is nonobvious under 35 U.S.C. § 103.

iii. No suggestion/motivation to modify Bergh in view of Greenaway and Farlex

Appellant submits that there is no suggestion or motivation in the prior art to modify Bergh in view of Greenaway and Farlex to utilize a photonic-bandgap fiber having a hollow core. In the August 25, 2006 Final Office Action, the Examiner states that “one having ordinary skill in the art would understand the combined teachings of Bergh, Greenway [sic], and Farlex suggests that a solid core photonic bandgap fiber would be modifiable with a hollow core photonic bandgap fiber.” However, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. (M.P.E.P. § 2143.01(III), page 2100-128, Rev. 5, August 2006; *see also, In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990).) Thus, merely being capable of modification is insufficient to provide the required suggestion or motivation to combine the cited references to present a *prima facie* case of obviousness.

In the August 25, 2006 Final Office Action, the Examiner also states that (emphasis in original):

**The motivation** for using the photonic bandgap fiber is, as disclosed by Greenway [sic], for the fiber’s high transmission efficiency, compact size, and reduced crosstalk; furthermore, a highly desired characteristic of a photonic bandgap fiber is its low sensitivity to temperature thus allowing the sensor to be used in highly fluctuated temperature environment.

However, Appellant submits that the various motivations cited by the Examiner are either attributed by Greenaway to multicore fibers and not to photonic-crystal fibers, or are not cited by Greenaway at all. Therefore, Greenaway does not provide the motivation to utilize a hollow-core photonic-bandgap fiber with the configuration of Bergh.

For example, at column 4, lines 28-43, Greenaway actually attributes the characteristics of compactness while maintaining low crosstalk to multicore fibers, not to photonic crystal fibers. At column 4, lines 29-49, Greenaway discloses that multicore fibers (emphasis added):

comprise multiple fibre cores, each with an associated cladding “region”. Each cladding region is smaller in cross-sectional area than would be required for typical cladding of cylindrical symmetry. This enables the cores to be more closely spaced than previously permitted, with regard to the requirements for avoiding crosstalk. This in turn results in an overall reduction of the diameter of a multicore cable. ...

Alternatively, the multicored fibre may be a photonic crystal fibre. This again provides the advantage of compactness. A photonic crystal fibre is another example of a multicored fibre in which crosstalk can be kept to an acceptable level, but overall fibre diameter is reduced in relation to a traditionally structured fibre bundle.

At column 17, lines 38-42, Greenaway further discloses that a multicore photonic fiber can have its cores more closely spaced than a standard multicore fiber. Thus, Greenaway discloses that multicore fibers provide the advantage of compactness while keeping crosstalk between the cores to an acceptable level, and that multicore photonic bandgap fibers also provide these advantages. Therefore, the purported advantages cited by the Examiner are actually attributable to multicore fibers and are not properly used as motivations to modify the teachings of Bergh by using a hollow-core photonic bandgap fiber.

In addition, contrary to the Examiner's assertion, Greenaway does not disclose or suggest that photonic crystal fibers, including hollow-core photonic crystal fibers, have a high transmission efficiency or that they have low sensitivity to temperature. Nowhere does Greenaway discuss the purported high transmission efficiency cited by the Examiner. With regard to temperature sensitivity, Greenaway at column 4, lines 40-43 discloses that:

[t]he component cores may be stress-inducing highly birefringent (HiBi) cores. This provides the sensor with the capability of discriminating between the effects of temperature and strain.

Thus, Greenaway discloses that multicore fibers having cores with a highly birefringent material, not photonic crystal fibers and certainly not hollow-core photonic crystal fibers, provide the capability of discriminating between temperature and strain effects. Therefore, the attribute of low sensitivity to temperature is not attributable to photonic crystal fibers and is not provided by hollow-core photonic crystal fibers.

Furthermore, Bergh, Greenaway, and Farlex do not disclose or suggest that any of the characteristics of photonic crystal fibers cited by the Examiner would be beneficial to the configuration disclosed by Bergh. Therefore, Appellant submits that Bergh, Greenaway, and Farlex do not provide a motivation to use photonic crystal fibers in the configuration disclosed by Bergh, so Claim 1 is nonobvious under 35 U.S.C. § 103.

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Claims 2, 10-15, and 49-57

If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.3d 1596 (Fed. Cir. 1988). Each of Claims 2, 11, 12, 14, and 49 depends from Claim 1, each of Claims 10 and 52-55 depends from Claim 2, Claim 13 depends from Claim 12, Claim 15 depends from Claim 14, each of Claims 50 and 51 depends from Claim 49, Claim 56 depends from Claim 55, and Claim 57 depends from Claim 56. Thus, each of Claims 2, 10-15, and 49-57 includes all the limitations of Claim 1 as well as other limitations of particular utility. Therefore, Appellant submits that Claims 2, 10-15, and 49-57 are also nonobvious under 35 U.S.C. § 103.

**Rejection of Claims 3-9 under 35 U.S.C. § 103(a) over Bergh in view of Greenaway and Michal**

As discussed above with regard to Claim 1, Appellant submits that the combination of Bergh in view of Greenaway does not disclose or suggest all the limitations of Claim 1 and that the prior art does not provide a motivation to modify the teachings of Bergh in view of Greenaway. Appellant submits that Michal does not disclose or suggest the limitations of Claim 1 which are missing from the combination of Bergh in view of Greenaway. Appellant further submits that Michal does not provide a motivation to combine Bergh, Greenaway, and Michal. Therefore, Claim 1 is patentably distinguished over the combination of Bergh, Greenaway, and Michal.

If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.3d 1596 (Fed. Cir. 1988). Claim 3 depends from Claim 2 which depends from Claim 1, and each of Claims 4-9 depends from Claim 2. Thus, each of Claims 3-9 includes all the limitations of Claim 1 as well as other limitations of particular utility. Therefore, Appellant submits that Claims 3-9 are also nonobvious under 35 U.S.C. § 103.

**Conclusion**

In view of the foregoing, Appellant respectfully submits that the rejections of Claims 1-15 and 49-57 are not well founded. Appellant therefore respectfully requests that the Board reverse the rejection of Claims 1-15 and 49-57.

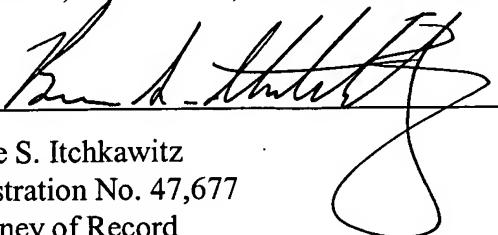
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Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP



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## VIII. CLAIMS APPENDIX

1. (Rejected) An optical sensor comprising:
  - a light source having an output that emits a first optical signal;
  - a first directional coupler comprising at least a first port, a second port and a third port, the first port optically coupled to the light source to receive the first optical signal emitted from the light source, the first port optically coupled to the second port and to the third port such that the first optical signal received by the first port is split into a second optical signal output by the second port and a third optical signal output by the third port;
  - a hollow-core photonic-bandgap fiber having a hollow core surrounded by a cladding, the hollow-core photonic-bandgap fiber optically coupled to the second port and to the third port to form an optical loop such that the second optical signal and the third optical signal counterpropagate through the hollow-core photonic-bandgap fiber and return to the third port and the second port, respectively, the cladding of the hollow-core photonic-bandgap fiber substantially confining the counterpropagating second optical signal and third optical signal within the hollow core; and
  - an optical detector located at a position in the optical sensor to receive the counterpropagating second and third optical signals after the second and third optical signals have traversed the hollow-core photonic-bandgap fiber.
2. (Rejected) The optical sensor of Claim 1, wherein the light source comprises a broadband source outputting light having a spectral distribution with a full width at half maximum of about 1 nanometer or larger.

3. (Rejected) The optical sensor of Claim 2, wherein the light source comprises a superfluorescent light source.
4. (Rejected) The optical sensor of Claim 3, wherein the light source mean wavelength is stable to at least about  $\pm 100$  parts per million.
5. (Rejected) The optical sensor of Claim 3, wherein the light source mean wavelength is stable to at least about  $\pm 10$  parts per million.
6. (Rejected) The optical sensor of Claim 3, wherein the light source mean wavelength is stable to at least about  $\pm 1$  part per million.
7. (Rejected) The optical sensor of Claim 3, wherein the light source mean wavelength is stable to at least about  $\pm 0.1$  part per million.
8. (Rejected) The optical sensor of Claim 3, wherein the superfluorescent light source comprises a superluminescent fiber source.
9. (Rejected) The optical sensor of Claim 3, wherein the superfluorescent light source comprises a light-emitting diode.
10. (Rejected) The optical sensor of Claim 2, wherein the light source comprises a broadband fiber laser.
11. (Rejected) The optical sensor of Claim 1, wherein the light source comprises a broadband source outputting light having a spectral distribution with a full width at half maximum of between about 1 nanometer and about 10 nanometers.
12. (Rejected) The optical sensor of Claim 1, further comprising an amplitude modulator that modulates the amplitude of the first optical signal output from the light source.

13. (Rejected) The optical sensor of Claim 12, wherein the amplitude modulator is external to the light source.

14. (Rejected) The optical sensor of Claim 1, further comprising a frequency modulator that modulates the frequency of the first optical signal output from the light source.

15. (Rejected) The optical sensor of Claim 14, wherein the frequency modulator is external to the light source.

16.-48. (Cancelled)

49. (Rejected) The optical sensor of Claim 1, further comprising a second directional coupler optically coupled to the light source and to the first port of the first directional coupler, the second directional coupler comprising at least a first port, a second port, and a third port, wherein:

the first port of the second directional coupler is optically coupled to the light source;

the second port of the second directional coupler is optically coupled to the first port of the first directional coupler; and

the third port of the second directional coupler is optically coupled to a non-reflective termination.

50. (Rejected) The optical sensor of Claim 49, wherein a polarizer is optically coupled to the second port of the second directional coupler and to the first port of the first directional coupler.

51. (Rejected) The optical sensor of Claim 49, wherein the second directional coupler comprises a fourth port that is optically coupled to a photodetector.

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52. (Rejected) The optical sensor of Claim 2, wherein the hollow-core photonic-bandgap fiber comprises polarization-maintaining photonic-bandgap fiber.

53. (Rejected) The optical sensor of Claim 2, wherein the hollow-core photonic-bandgap fiber comprises a plurality of features arranged in a periodic array across a cross-section of the hollow-core photonic-bandgap fiber that surrounds the hollow core.

54. (Rejected) The optical sensor of Claim 2, wherein the hollow-core photonic-bandgap fiber comprises a Bragg fiber.

55. (Rejected) The optical sensor of Claim 2, wherein the hollow-core photonic-bandgap fiber cladding comprises a silica-based glass.

56. (Rejected) The optical sensor of Claim 55, wherein the cladding further comprises a periodic array of channels in the silica-based glass.

57. (Rejected) The optical sensor of Claim 56, wherein the channels are hollow.

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## **IX. EVIDENCE APPENDIX**

1. U.S. Patent No. 4,773,759, issued to Bergh et al. (“Bergh”); cited by the Examiner in February 9, 2006 Final Office Action, June 8, 2006 Advisory Action, and August 25, 2006 Final Office Action.,
2. U.S. Patent No. 6,389,187, issued to Greenaway et al. (“Greenaway”); cited by the Examiner in February 9, 2006 Final Office Action, June 8, 2006 Advisory Action, and August 25, 2006 Final Office Action.
3. “The Free Dictionary by Farlex (<http://encyclopedia.thefreedictionary.com/Photonic-crystal+fiber>)” (“Farlex”); cited by the Examiner in August 25, 2006 Final Office Action.
4. U.S. Patent No. 6,108,086, issued to Michal et al. (“Michal”); cited by the Examiner in February 9, 2006 Final Office Action, June 8, 2006 Advisory Action, and August 25, 2006 Final Office Action.

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**Customer No.: 20,995**

#### **X. RELATED PROCEEDINGS APPENDIX**

None.

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